

here established fact that even within the taxonomic family of the finches, the sex type of the plumage is determined in one species (sparrow) directly by the genetical constitution of the feather forming cells, and in another species (orange weaver) through free circulating hormones in the blood stream. It might well be that, through the closer study of such cases of substitution of hormone by direct genetical control, we shall be able to learn more about the physiological nature and the mode of action of the hereditary element, the mysterious gene.

BIBLIOGRAPHY

- Bissonnette, T. H. 1932. Light and diet as factors in relation to sexual periodicity. *Nature*, 129, 613.
- Cole, L. J. 1933. The relation of light periodicity to the reproductive cycle, migration, and distribution of the mourning dove. *The Auk*, 50, 284.
- Keck, W. N. 1934. The control of the secondary sex characters in the English Sparrow, *Passer domesticus*. *Jour. Exp. Zool.*, 67, 315.
- Kirschbaum, A. 1933. Experimental modification of the seasonal sexual cycle of the English Sparrow, *Passer domesticus*. *Anat. Rec.* 57, Suppl. 62.
- Miller, Dorothea S. 1935. Effects of thyroxin on plumage of the English Sparrow, *Passer domesticus*. *Jour. Exp. Zool.*, 71, 293.
- Miyazaki, H. 1934. On the relation of the daily period to the sexual maturity and to the moulting of *Zosterops palpebrosa japonica*. *Sci. Rep. Tôhoku Imp. Univ.* IV, 9, 183.
- Rowan, W. 1931. *The riddle of migration*. Baltimore.
- Witschi, E., and W. N. Keck. 1935. Differential effect of some gonadotropic substances on development of cyclical sex characters in the English Sparrow. *Proc. Soc. Exp. Biol. and Med.*, 32, 598.

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NESTING OF THE RAVEN IN VIRGINIA

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Dark shadows were forming in the deep hollows leading down from the Shenandoah Mountains. The sun had already passed out of sight on the other side, and now twilight prevailed. Silence reigned everywhere over a snow-elad landscape which appeared to be devoid of life.

High up on the side of the mountain perched on an old dead snag leaning over a steep rock cliff sat a Raven in owl-like posture, seemingly in deep thought. Perhaps he was dreaming of bygone days when his kind inhabited all of the eastern mountain ranges in a land of plenty where game of all kinds was abundant and food easily procured. What now? Gone forever were the millions of Passenger Pigeons whose flight at times darkened the skies. The bugling of the elk was no longer heard. The land of abundance and plenty had van-

ished, and of the multitudes only a few remnants could now be found to mark their passing.

First came the large band-saw mills which were supplied with timber by the logging trains that penetrated even to the remotest sections of the mountains. Soon afterwards all of the best of the big trees had been cut down, and now followed devastating forest fires which destroyed everything in their path and the once enchanted fairy-land formed by nature was converted into a desolate waste.

Of a wild nature which craves freedom and seclusion the Ravens could not cross the barriers erected by civilization, and with all of their range and food supply destroyed there was nothing left for them but starvation, and starve they did. Still the older generation of the mountain folks often ask me, "What has become of the Ravens?" They do not take in consideration what had gone before, nor the part they played in the passing of the Ravens when they periodically set fires to the mountains to make huckleberry picking easier and more profitable. Such futile questions were better left unanswered.

No wonder this pitiful remnant of the multitudes seemed to be in deep thought, for he was no doubt going supperless to roost, as he had done many times before. This was one of a pair which had a nest in the cliffs below the dead snag, and to which they returned each day before nightfall—for the Ravens' nest is their home. Nearly always, too, they are seen in pairs, and it has been said by many naturalists that they remain mated for life. My limited knowledge of them tends to confirm this belief also, for one of my favorite pairs of Ravens, which I have known for fourteen years, have remained together during that time. They are not to be mistaken for any others which overlap their range, for both have voices which are quite distinctive. One has a mellow call-note somewhat similar in tone to that of the Canada Goose, and it is never without a thrill that I mark the passing of this bird high overhead on slowly beating wings, flying to the high cliffs overlooking the wide spaces below.

It is now early March and nesting time somewhat delayed by many snows and unusually cold weather, was close at hand. During the previous month the nesting shelf had been swept clean of all of the old nest material, and was ready for the new one that was to occupy the same place. Contrary to general belief and the stories which have been written about their nesting, no part of the old nest is ever used.

Soon afterwards both birds could be seen around their nesting cliffs, most any time during the day, working on their new nest or

sitting on the rocks or old snag above. From a vantage point about a mile away I could daily watch their activities through my binoculars; and they would no doubt have been much disturbed had they known how often I was spying on them. When one bird would fly to the nest on the rocks the other would perch above, and at intervals would sail from the cliffs to see that no intruder approached unobserved. Once when I saw them both leave together I went up to their cliff and inspected the nest from below, but, not wishing them to find me there on their return, I did not tarry long.

A few hundred feet down from the Ravens' nest a pair of Duck Hawks had appropriated an old nest formerly used by Ravens and were on constant guard duty there. While it is at times possible to visit Ravens' nests unobserved by them, there is not a chance of reaching the nest of these falcons unseen by one or both of them. Starting down the mountain I was soon greeted by the cries of the male Duck Hawk which immediately attracted the attention of the other. Now I had both flying over me, protesting the invasion in no uncertain terms, and the fuss they made soon brought both Ravens to see what was causing the disturbance. Looking into the hawks' nest from an adjoining chimney rock and seeing that as yet there were no eggs, I went on back and over the top of the mountain. All the way up I was escorted by one of the Ravens soaring in circles overhead. After reaching the top the male Duck Hawk seemed to get tired of the fuss the Raven was making and drove him back down under the mountain. After the first swoop of the hawk, the Raven lost further interest in me and left in undignified haste, knowing well that this was no time to hesitate if he wished to escape with a whole skin.

During the latter part of March only one Raven was seen over the cliffs, so now the full set of eggs had been laid and the female was on the nest engaged in the labor of hatching out the young ones. Going up to investigate I was met by the alert male bird on watch, who continued to circle around me until I got close to the nest when he flew directly past the nest to warn his mate of approaching danger. This she disregarded, for it was not until I was within fifteen feet of the nest above that she left and flew overhead so close that she appeared to be twice as large as she really was. Not often is an opportunity afforded of seeing a Raven so close, for they are the wildest of all birds; and even in going from one mountain range to another their flight is always high out of danger from below.

Their selection for a nesting site was a high cliff from which the whole of the surrounding country could be viewed. The nest was on a small shelf back in a pocket of the rocks and under the steep overhanging rocks above, which made it inaccessible from that point—this being the usual situation. Reaching the nest by going up from the bottom of the cliffs, I found it to contain five eggs, which was the average number found in those Ravens' nests I had examined. The nest was nicely and compactly made of small sticks with fine black birch twigs and roots on the inner side next to the lining; the latter was composed of very finely shredded inner chestnut-tree bark with a small amount of sheep's wool intermingled. Ordinarily wool is one of the principal materials used by them for their nest linings, but as this particular mountain section was not used for sheep-grazing, wool was hard for them to obtain, except in the cultivated areas where the Ravens would not venture. Beneath the thick lining I found two inches of soil, which was also used in all of the four other nests examined in this range during the nesting season of 1934. Nests found in previous years 250 miles farther south were lined with equal parts of usnea moss and wool, with no earth used beneath the lining. Just why the difference in construction of the nests in various localities I am unable to say, unless the combination of moss and wool forms a sufficient insulation for the thin-shelled eggs which is lacking in the lining made of the inner bark. It is to be remembered that when the eggs are laid the cliffs are still covered with ice and the weather is far from being spring-like.

This nest, like all the other Ravens' nests which I have found, was smoothly finished on the inside and deeply cupped, almost like an inverted cone. It measured twenty-three by thirty-six inches outside diameter, while the cavity was twelve inches in diameter and five inches deep. Where it was situated no rain nor sunshine could ever penetrate, and this location, used by many generations of Ravens, had a large accumulation of materials below which had composed the old nests. It was one of the few places left which was not likely to be disturbed by unwelcome visitors and the presence of mankind.

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